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(71) Patent Assignee: Matsushita Denki Sangyo KK

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(54) [Name of the Invention]

Gas Discharge Panel and Its Manufacturing Method and Together With That Equipment for the Manufacturing of the Gas Discharge Panel

(57) [Abstract]

[Problem]

To suggest a partition wall that has a good accuracy and is easily stabilized at the time of the manufacturing of the partition wall of a gas discharge panel.

[Solution Measures]

A gas discharge panel manufacturing method characterized by the fact that it is a manufacturing method for a gas discharge panel, which is provided with a pair of substrates where one of their surfaces has been provided with a number of discharge display electrodes, and these surfaces are facing each other, a partition wall which holds the above described substrate plates at a predetermined distance and together with that also separates the immediately adjacent display parts, a sealing material, which seals the periphery of the substrate plates, and gas used for the electrical discharge; where the partition wall 4 is formed by the following technological processes: the technological process (a) whereby a partition wall member 1, which has a predetermined softness, is formed with a predetermined thickness on the front surface of the substrate plate 2 as a surface shape, the technological process (b) whereby the partition wall 1 is press molded by using a press mold that has a shape corresponding to the partition wall 4, that must be formed, the technological process (c) whereby the press molding die 3 is separated from the partition

wall member 1, and the technological process (d) whereby the partition wall member 4 is heat treated at a predetermined temperature after the molding.

[Scope of the Claims of the Invention]

[Claim 1]

A gas discharge panel manufacturing method characterized by the fact that it is a manufacturing method for a gas discharge panel, which is provided with a pair of substrates where at least one of their surfaces has been provided with a number of discharge displaying electrodes, and these surfaces are facing each other, a partition wall which holds the above described substrate plates at a predetermined distance and together with that also separates the immediately adjacent display parts, a sealing material, which seals the periphery of the substrate plates, and gas used for the electrical discharge;

where the partition wall is formed by the technological process whereby a partition wall member, which has a predetermined softness, and which is formed with a predetermined thickness on the front surface of the substrate plate as a surface shape, the technological process whereby the partition wall is press molded by using a press mold that has a shape corresponding to the partition wall, that must be formed, the technological process whereby the press molding die is separated from the partition wall member, and the technological process whereby the partition wall member is heat treated at a predetermined temperature after the molding.

[Claim 2]

A gas discharge panel manufacturing method characterized by the fact that it is a manufacturing method for a gas discharge panel, which is provided with a pair of substrates where at least one of their surfaces has been provided with a number of discharge displaying electrodes, and these surfaces are facing each other, a partition wall which holds the above described substrate plates at a predetermined distance and together with that also separates the immediately adjacent display parts, a sealing material, which seals the periphery of the substrate plates, and gas used for the electrical discharge;

where the partition wall is formed by the technological process whereby a partition wall member, which has a predetermined softness, and which is formed with a predetermined thickness on the front surface of the substrate

plate as a surface shape, the technological process whereby the above described partition wall is molded as a cylindrically shaped press mold that has a shape corresponding to the partition wall, that must be formed, is rotated as it is pressed, and the technological process whereby the partition wall member is heat treated at a predetermined temperature after the molding.

[Claim 3]

A gas discharge panel manufacturing method characterized by the fact that it is a manufacturing method for a gas discharge panel, which is provided with a pair of substrates where at least one of their surfaces has been provided with a number of discharge displaying electrodes, and these surfaces are facing each other, a partition wall which holds the above described substrate plates at a predetermined distance and together with that also separates the immediately adjacent display parts, a sealing material, which seals the periphery of the substrate plates, and gas used for the electrical discharge;

where the partition wall is formed by the technological process whereby a partition wall member, which has a predetermined softness, and which is formed with a predetermined thickness on the front surface of the substrate plate as a surface shape, the technological process whereby the above described partition wall is molded as a cylindrically shaped press mold, that has a shape corresponding to the partition wall, that must be formed, is pressed by a back up roller that is positioned at the same rotation axis, and that has hardness properties higher than those of the above described press mold, and it is pressed on the front surface of the above described partition wall member and it is rotated, and the technological process whereby the partition wall member is heat treated at a predetermined temperature after the molding.

[Claim 4]

A gas discharge panel manufacturing method according to the above described Claim 2 or Claim 3, that is characterized by the fact that as the gap between the center of the rotation axis of the cylindrically shaped press mold and the substrate plate with the formed partition wall member is held constant, the above described press mold is rotated and the partition wall is formed.

[Claim 5]

A gas discharge panel manufacturing method according to the above described Claim 2 or Claim 3, that is characterized by the fact that the partition wall is formed as the substrate plate with the partition wall member formed on it is moved at a transfer speed that corresponds to the rotation circular speed of the cylindrically shaped press mold.

[Claim 6]

A gas discharge panel that has a partition wall that is formed by the technological process whereby a partition wall member, which has a predetermined softness, is formed with a predetermined thickness on the front surface of the substrate plate as a surface shape, the technological process whereby the partition wall is press molded by using a press mold that has a shape corresponding to the partition wall, that must be formed, the technological process whereby the press molding die is separated from the partition wall member, and the technological process whereby the partition wall member is heat treated at a predetermined temperature after the molding.

[Claim 7]

A gas discharge panel that has a partition wall that is formed by the technological process whereby a partition wall member, which has a predetermined softness, is formed with a predetermined thickness on the front surface of the substrate plate as a surface shape, the technological process whereby the above described partition wall is molded as a cylindrically shaped press mold that has a shape corresponding to the partition wall, that must be formed, is rotated as it is pressed, and the technological process whereby the partition wall member is heat treated at a predetermined temperature after the molding.

[Claim 8]

A manufacturing equipment for the preparation of a gas discharge panel that is equipped with the following: it is equipped with a press mold that is provided with a shape that corresponds to the partition wall that must be formed, a means whereby a partition wall member, which has a predetermined softness, and which is formed with a predetermined thickness

on the front surface of the substrate plate as a surface shape, is formed as it is pressed by the above described press mold.

[Claim 9]

A manufacturing equipment for the preparation of a gas discharge panel that is equipped with the following: it is equipped with a cylindrically shaped press mold that is provided with a shape that corresponds to the partition wall that must be formed, a means whereby a partition wall member, which has a predetermined softness, and which is formed with a predetermined thickness on the front surface of the substrate plate as a surface shape, is formed as it is pressed by the above described press mold.

[Detailed Explanation of the Invention]

[0001]

[Technological Background Pertinent to the Present Invention]

The present invention is an invention about a gas discharge panel and its manufacturing method and together with that it is also an invention about its manufacturing equipment. And especially, the present invention is an invention about the manufacturing method for the formation of a partition wall, which partitions the display parts of the gas discharge panel, and its manufacturing equipment, and together with that the present invention is an invention about a gas discharge panel that has a partition wall that is manufactured by the above described manufacturing method.

[0002]

[Prior Art]

In the past, the items produced by the technology related to the gas discharge panel, and specifically, the items that have been capable of color display, have been for example, the indicated here below items. Figure 2 represents a diagram, which shows a schematic structural diagram of a gas discharge panel according to the previous technology. Figure 2 (a) represents a three-dimensional view of a partial section, and Figure 2 (b) is its top view diagram, Figure 2 (c) is a diagram of its partial sectional surface. According to Figure 2, 4 represents the partition wall, 5a represents the display

electrode, 5b represents the data electrode, 6 represents the dielectric electrode, 7 represents fluorescent light material, 10 is a protective layer, 25 represents the top part substrate plate and 26 represents the bottom part substrate plate.

[0003]

As it is shown according to the presented in this figure, in the case of the gas discharge panel according to the previous technology, it is a panel that is obtained according to the following: on the surface of the top part substrate plate 25 a number of display electrodes 5a, is provided, and the dielectric material 6 is provided so that this group of electrodes is entirely covered, and on the surface of the bottom part substrate plate 26 a number of data electrodes 5 b, is provided, so that they are directly crossing with the display electrodes 5 a, that have been provided on the surface of the top part substrate plate 25, and the dielectric material 6, which covers these data electrodes 5b, and then, the partition wall 4, which is used in order to partition the immediately adjacent display voids, the and the fluorescent light material, which realizes the color display, are provided, and the each of the electrode formed surfaces of the top part substrate plate 25 and the bottom part substrate plate 26 are made to face each other and the periphery is sealed under a high vacuum, and the atmosphere in its internal part is exchanged with a discharge gas which is obtained as for example helium and xenone are mixed. In the space between the display electrodes 5 and the data electrodes 5 b of this gas discharge electrode a predetermined electrical voltage is applied, and the atoms of the discharge gas are excited, and at the time when these excited atoms return to their stable state, for example, a 147 nm vacuum ultra-violet beam is irradiated, and the fluorescent light material generates excited light through the above described vacuum ultra-violet beam, and by that the display becomes possible.

[0004]

Here, an explanation will be provided regarding the manufacturing technological process for the preparation of the partition wall, which is used in order to partition the hollow display space according to the gas discharge panel using the previous technology. This technological process has been conducted in the past by a printing process, however, by using a one time printing sufficient thickness is not obtained, and the process is conducted as at the time when multiple printing and drying technological processes are

used, these processes are repeated 10 times or more, and then after that an annealing is conducted. Also, as a different method, there is the method where the partition wall member material is introduced into the groove of a tool that has the shape of the partition wall that must be formed, and the above described tool is adhered onto a glass substrate plate that has been coated in advance with a paste, and after that, the tool is taken away from the glass substrate plate and an annealing is conducted, and by that the partition wall is formed (reported according to the description in the Japanese Patent Application Laid Open Number Hei-Sei 1-137534).

[0005]

[Problems Solved by the Present Invention]

However, in the case of the manufacturing method for the formation of partition wall through the printing used according to the previous technology such as the one described here above, for the formation of the partition wall it is necessary to conduct a number of repeated printing and drying processes and then after that an annealing process is conducted, and this takes an extremely high amount of labor and time, and not only that, but also, the accuracy of the printing equipment, the accuracy of the positioning of the printing plate and the substrate plate, the accuracy of the stacking that is affected by the extension of the printing plate due to the squeegee, etc., are significantly deteriorated, and there has been the problem that this becomes a poor product etc.

[0006]

Also, in the case of the explained within the examples according to the previous technology another manufacturing method for the formation of the partition wall, on the tool where in the groove the partition wall member material has been introduced a glass substrate plate that has been coated in advance with a paste, is adhered and at the time when the tool is separated and taken away from the glass substrate the release properties between the partition wall member material and the tool are poor, and partition wall member material remains inside the tool, and there have been the problems that the shape of the partition wall becomes significantly deteriorated and this becomes a poor product and together with that the tool cannot be repeatedly used and the manufacturing becomes extremely complex.

[0007]

The present invention is an invention that solves the above described problems as the partition wall can be manufactured by a simple manufacturing process with an extremely good accuracy, and by that a stable gas discharge panel is manufactured, and a good quality and inexpensive gas discharge panel is practically realized.

[0008]

[Measures in Order to Solve the Problems]

In order to solve the above described problems, the gas discharge panel manufacturing method according to the Claim 1 of the present invention is a method where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded by using a press mold that has a shape corresponding to the partition wall, that must be formed.

[0009]

The gas discharge panel manufacturing method according to the Claim 2 of the present invention is a method where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded as a press mold, that has a cylindrical shape that has been provided with the shape corresponding to the partition wall, that must be formed, is pressed as it is rotated.

[0010]

The gas discharge panel manufacturing method according to the Claim 3 of the present invention is a method where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is formed as a cylindrically shaped press mold, that has a shape corresponding to the partition wall, that must be formed, is pressed by a back up roller that has a

rotation axis that is parallel to the above described press mold as, it is rotated.

[0011]

The gas discharge panel according to the Claim 6 of the present invention is a panel that is provided with a partition wall where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded by using a press mold that has a shape corresponding to the partition wall, that must be formed.

[0012]

The gas discharge panel according to the Claim 7 of the present invention is a panel that is provided with a partition wall where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded as a press mold, that has a cylindrical shape that has been provided with the shape corresponding to the partition wall, that must be formed, is pressed as it is rotated.

[0013]

The manufacturing equipment for the manufacturing of the gas discharge panel according to the Claim 8 of the present invention is an equipment with a structure whereby in the technological process for the formation of the partition wall, the partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press formed by a press mold that has been provided with a shape that corresponds to the shape of the partition wall that must be formed.

[0014]

The manufacturing equipment for the manufacturing of the gas discharge panel according to the Claim 9 of the present invention is an equipment with a structure whereby in the technological process for the formation of the partition wall, the partition wall member, which has a predetermined

softness, and which is formed on the front surface of the substrate plate as a surface shape, is press formed by a cylindrically shaped press mold that has been provided with a shape that corresponds to the shape of the partition wall that must be formed.

[0015]

[Conditions of the Practical Embodiment of the Present Invention]

The first gas discharge panel manufacturing method according to the present invention is a method where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded by using a press mold that has a shape corresponding to the partition wall, that must be formed.

[0016]

The second gas discharge panel manufacturing method according to present invention is a method where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded as a press mold, that has a cylindrical shape that has been provided with the shape corresponding to the partition wall, that must be formed, is pressed as it is rotated.

[0017]

The third gas discharge panel manufacturing method according to the present invention is a method where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is formed as a cylindrically shaped press mold, that has a shape corresponding to the partition wall, that must be formed, is pressed by a back up roller that has a rotation axis that is parallel to the above described press mold as, it is rotated.

[0018]

The first gas discharge panel according to the present invention is a panel that is provided with a partition wall where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded by using a press mold that has a shape corresponding to the partition wall, that must be formed.

[0019]

The second gas discharge panel according to the present invention is a panel that is provided with a partition wall where the technological process for the formation of the partition wall is a technological process whereby a partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press molded as a press mold, that has a cylindrical shape that has been provided with the shape corresponding to the partition wall, that must be formed, is pressed as it is rotated.

[0020]

The first manufacturing equipment for the manufacturing of the gas discharge panel according to the present invention is an equipment with a structure whereby in the technological process for the formation of the partition wall, the partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press formed by a press mold that has been provided with a shape that corresponds to the shape of the partition wall that must be formed.

[0021]

The second manufacturing equipment for the manufacturing of the gas discharge panel according to the present invention is an equipment with a structure whereby in the technological process for the formation of the partition wall, the partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, is press formed by a cylindrically shaped press mold that has

been provided with a shape that corresponds to the shape of the partition wall that must be formed.

[0022]

According to the present invention, on the front surface of the partition wall member, which has a predetermined softness, and which is formed on the front surface of the substrate plate as a surface shape, the press mold that has been provided with a shape corresponding to the shape of the partition wall that must be formed, is pressed, and the shape of the die is copied onto the partition wall material, and after the partition wall member has been formed, the press mold is die released, and because of that it is possible to form the partition wall extremely easily and a stable gas discharge panel manufacturing is practically realized. Also, because of the fact that the shape of the die is copied onto the partition wall material, by increasing the degree of accuracy of the shape of the die it is possible to form a partition wall with an extremely good accuracy.

[0023]

(Practical Example 1)

The first example of the practical implementation of the present invention is explained by using the diagram presented in Figure 1. First, as it is shown in Figure 1 (a), on the surface of the substrate plate 2, the partition wall material 1, which has such softness that it can be easily formed by a press die, is formed as a surface shape with the predetermined thickness. Here, it is necessary that the partition wall material 1 is resistant to high temperature and high pressure, does not present problems with respect to gas generation under vacuum, and also, it has good adhesive properties relative to the underlying substrate plate, and then, it also has sufficient insulation properties, and because of that, it is preferred to use a material obtained as glass or ceramics etc., powder type material and a low melting point glass are mixed with an appropriate binder and an appropriate solvent agent and the predetermined softness is achieved.

[0024]

After that, a press die 3 is prepared, which is provided with a shape that corresponds to the shape of the partition wall 4 that must be formed, for example, a stripe shaped partition wall with a width of 0.1 mm, height of 0.2 mm, pitch of 0.5 mm. The material of the press die is for example glass, ceramics or metal etc.

[0025]

Then, as it is shown according to the presented in Figure 1 (b), the press die 3 is adhered onto the surface of the partition wall material 1, and after that, at a predetermined pressure the upper part of the press die 3 is subjected to an elevated pressure, and by that the partition wall material 1 is press formed. After that, as it is shown according to the presented in Figure 1 (c), the press die 3 is separated from the partition wall material 1, and it is dried under predetermined conditions and after that it is annealed. Here, as the drying conditions, for example a temperature of 120oC and a time within the range of 10 ~ 20 minutes are used, and also as the annealing conditions, for example, a temperature of 450oC and a time period of 30 minutes, are used.

[0026]

According to the above described technological processes, it becomes possible to manufacture a partition wall easier and within a shorter time period compared to the methods according to the previous technology, and not only that, but also, it is possible to manufacture the partition wall with an extremely good precision and by a stable process.

[0027]

(Practical Example 2)

The second practical implementation example according to the present invention will be explained by using the diagrams presented in Figure 3. In the case of the second practical implementation example, it has different characteristics specifically for the press molding technological process according to the first practical implementation example, and all the other technological processes are almost the same as those described according to the first practical implementation example, and because of that, here, only the press molding technological process will be explained.

[0028]

First, The cylindrically shaped die 8, which has been provided with a shape corresponding to the shape of the partition wall that must be formed, is prepared. Here, as the shape that must be formed, it is a good option, the longitudinal stripe shaped press die 11 is used, where, for example, relative to the stripe shape shown according to the Practical Example 1, as it is shown in Figure 4 (a), the stripes have been formed in a direction that is crossing at a right angle relative to the axial direction of the cylindrically shaped press die, and it is also a good option if a transverse stripe shape press die 12 is used, where as it is shown according to the presented in Figure 4 (b), these are formed in the parallel direction. Also, in the case when the shape of the partition wall that must be formed has a lattice shape, it is also a good option to use a lattice shape press die as it is shown according to the presented in Figure 4 (c). The material of the cylindrically shaped press die is, for example, metal.

[0029]

After that, as it is shown in Figure 3, as the above described cylindrically shaped press die 8 is pressed on the surface of the partition wall material 1 it is rotated and the material is molded. It is also a good option if at this time the substrate plate 2 with the formed on it partition wall material 1 is moved at a speed that corresponds to the rotational circular speed of the cylindrically shaped press die 8. By doing that, the partition wall material 1 is press molded into the shape that must be formed.

[0030]

(Practical Example 3)

After that, the third practical implementation example according to the present invention is explained by using the diagram shown in Figure 5. In the case of this third practical implementation example, shows one practical implementation example of the case where for example, compared to the second practical implementation example, it is desired that at the time of the press molding, the pressure force is increased to be higher than the case when problems arise due to bending deformations etc., of the cylindrically shaped press die 8, caused by the pressing pressure.

[0031]

In the case when according to the above described, at the time when by using the cylindrically shaped press die 8, the partition wall material 1 is press molded, the bending deformation etc., of the press mold 8 caused by the pressure force becomes a problem, as it is shown in Figure 5, the cylindrically shaped press die 8 is subjected to a pressure force by the back up roller 9 and the deformation of the press mold 8 is reduced and the partition wall material can be also formed under such conditions.

[0032]

(Practical Example 4)

After that, the fourth practical implementation example according to the present invention will be explained by using Figure 6. As it is shown according to the diagram presented in Figure 6, the distance 15, that is between the center of the rotation axis 14 of the press die 8, and the front surface of the substrate plate 2 with the formed on it as a surface shape partition wall material 1, even though it is not shown in the figure, is held constant by, for example, a roller that is rotating freely as it contacts the front surface of the substrate plate and has as its rotation axis the center of the rotation axis 14. By doing that, the cylindrically shaped press mold 8 is pressed onto the front surface of the partition wall material 1, as it is rotating, and the partition wall 4 is molded. Because of the fact that the distance 15, that is between the center of the rotation axis of the press die 8, and the substrate plate 2 is held constant, the molded partition wall 4 becomes a wall that has a constant height from the substrate plate 2.

[0033]

(Practical Example 5)

After that the fifth practical implementation example according to the present invention will be explained based on the presented in Figure 7 (a). First, on the surface of the top part of the substrate part 25 by using sputtering etc., method, an electroconductive thin layer was formed, and then after that by using etching etc., means, the above described electroconductive thin layer is patterned and a number of display electrodes 5a are provided, and then a dielectric material 6 is provided by for example

printing and annealing so that it covers entirely these display electrodes 5a, and then, on the top part of the dielectric material 6 by using sputtering means etc., a protective layer 10 is formed, that is obtained from MgO etc., material, and the upper part of the substrate plate 25 is made.

[0034]

After that, on the surface of the bottom substrate plate 26, the numerous data electrodes 5 b, which are crossing with the display electrodes 5 a that have been provided on the surface of the top part substrate plate 25, and also the bottom part dielectric material layer 16, which is provided so that it covers these data electrodes 5b, are correspondingly formed by the same method as that used for the top part substrate plate 25.

[0035]

After that, a partition wall material that has the predetermined softness is formed with the predetermined thickness on the front surface of the bottom part substrate plate 26 as a surface shape, and by using a press mold that is provided with a shape that corresponds to the shape of the partition wall that must be formed, the partition wall material 1 is press molded by a pressure force that is applied uniformly over the entire surface, and subsequently, the press mold 3 is separated from the partition wall material 1, and for example, it is dried at a temperature of 120oC for a period of 10 minutes and after that, an annealing treatment is conducted under condition of a temperature of 450oC for a period of 30 minutes, and by that the partition wall is formed.

[0036]

After that, the surfaces with the electrodes formed on them of the top part substrate plate 25 and the bottom part substrate plate 26 are placed so that they are opposing each other and they are adhered. After that, the perimeter of the substrate plate is sealed by using a frit glass etc., sealing material, and the inner part that is surrounded by both substrate plates and the sealing material is vacuumed and after that, for example, the atmosphere is exchanged with a mixed gas containing helium and xenone, and it is sealed and this becomes a gas discharge panel.

[0037]

In Figure 7 (a), a method is shown where the bottom part dielectric material layer 16 is formed and after that the partition wall 4 is formed, however, as it is shown according to the presented in Figure 7 (b), it is also a good option if the partition wall material 1 is formed by the dielectric body material and this is press molded by using the press mold 8, and then the bottom part dielectric material layer 16 is formed at the same time as the partition wall 4.

[0038]

(Practical Example 6)

After that, an explanation of the sixth practical implementation example according to the present invention will be presented. According to this practical example, it is an example where the technological processes related to the formation of the partition wall are the same as those described in the case of the fifth practical implementation example, and its characteristic is the fact that it is an example where the partition wall 4 forming method used is the method that has been described in the second practical example, and it is a gas discharge panel that is equipped with a partition wall 4 that has been formed in such a way.

[0039]

(Practical Example 7)

After that, by using the diagram shown in Figure 8, an explanation of the seventh practical implementation example according to the present invention will be provided. Figure 8 is a sectional view diagram showing one example of the fundamental (essential) structure of the manufacturing equipment that makes possible the formation of the partition wall of the gas discharge panel. In Figure 8, 20 represents the stage that is placed on a predetermined position on the substrate plate that has on it the partition wall material formed as a surface shape, 21 is a pressure part, that is provided with a structure that generates a change in position by for example by an oil pressure mechanism or a ball screw etc., rotation. On the bottom part of the pressure part 21, the press die 3 is attached.

[0040]

First, through a pin etc., that has a determined position on the surface of the stage, the substrate plate 2, which has the partition wall material 1 formed on it as a surface shape, is provided at the predetermined position, for example it is fixed by a vacuum suction etc. After that, by the press die 3 that has been attached onto the pressure part 21, the partition wall material 1 is pressed, and by that the partition wall 4 is formed.

[0041]

According to the above described, this practical implementation example is an example that is a practical realization of the first practical implementation example, and it is an example where a manufacturing equipment is suggested whereby it is possible to form easily a high precision partition wall.

[0042]

(Practical Example 8)

After that, the eighth practical implementation example according to the present invention will be explained by using the diagram presented in Figure 9. Figure 9 (a) is the top view diagram showing one example of the fundamental (essential) structure of the manufacturing equipment that makes possible the formation of the partition wall of a gas discharge panel. Figure 9 (b) is a three-dimensional view diagram of the A-A sectional surface. In Figure 9 (a), 33 represents the pinion that changes the rotation of the cylindrically shaped press die 8 linearly along the table 31, 34 represents a rack that is receptor for the pinion 33, 35 represents a position determining pin that determines the position of the substrate plate 1, 40 represents a pulley that transmits a movement to the cylindrically shaped press die 8, 41 is a start up (driving) motor, and 42 is a gear belt that connects the driving motor 41 and the pulley 41.

[0043]

According to Figure 9 (b), 30 represents the base B, 31 is a movable, table where the substrate plate 2 is positioned, 32 represents a linear guide that linearly transmits the movement of the table 31, 36 represents a pressure adjusting screw, which adjusts the pressure that is applied onto the partition wall material 1 by the cylindrically shaped press die 8, 37 represents a

bearing A, which supports the rotational axis of the cylindrically shaped press die 8, 38 represents a guide A that fixes the bearing 37, and 39 represents a spring that supports the guide 38.

[0044]

First, on the surface of the manufacturing equipment table 31, that has the above described structure, the substrate plate 2, with the formed on it as a surface shape partition wall material 1, is set at the predetermined position the same way as in the case of the Practical Example 7. After that, the table 31 is moved to a position where the edge part of the substrate plate 2 can be directly underneath the press die 8. Subsequently, by using the pressure adjusting screw 36, the pressure that is applied onto the partition wall material by the press die 8 is adjusted. After that, the driving motor 41 is rotated, and through the gear belt 42 its motion is transferred, and the press die 8 is rotated, and through the rack 34 and the pinion 33, the table 31 also starts to move at the same rotational speed as that of the press die 8, and by that the partition wall is formed.

[0045]

By doing that, in the case of this practical implementation example, it is possible to suggest manufacturing equipment whereby it is possible to easily and stably form a partition wall.

[0046]

(Practical Example 9)

After that, the ninth practical implementation example according to the practical example will be explained by using the diagram shown in Figure 10. Here, Figure 10 represents a cross sectional view diagram showing one example of the fundamental structure of manufacturing equipment whereby it is possible to form the partition wall of a gas discharge panel. In Figure 10, 52 represents the bearing B, 53 represents the guide B, which fixes the bearing B. Here, the same essential elements of the structure are denoted by the same symbols and these will not be explained. In the case of this practical example, it is a manufacturing equipment that is effective in the case where according to the presented in the Practical Example 8, in order to increase the pressure of the press die 8, the axis part of the press die 8 is

pressurized and by that, the bending deformation of the cylindrically shaped press die 8, becomes a problem. The same way a sin the case of the above described practical example, the substrate plate 2 is set on the table 31, and it is moved to the predetermined position, and after that, by using the pressure adjusting screw 36, the pressure of the back up roll 9 is adjusted. By the same actions as those described according to the Practical Example 8, the partition wall is formed.

[0047]

This way, in the case of this practical example, it is an example suggesting manufacturing equipment for the easy and stable formation of a partition wall, with a good precision.

[0048]

[Results From the Present Invention]

According to the above described, in the case of the first manufacturing method for the preparation of a gas discharge panel according to the present invention, on the substrate plate with the formed on it in a surface shape partition wall material, a press die, that has a shape that corresponds to the shape of the partition wall that must be formed, is pressed and by that, easily and stably it is possible to form a partition wall.

[0049]

Also, according to the above described, in the case of the second manufacturing method for the preparation of a gas discharge panel according to the present invention, on the substrate plate with the formed on it in a surface shape partition wall material, a cylindrically shaped press die, that has a shape that corresponds to the shape of the partition wall that must be formed, is pressed and by that, easily and stably it is possible to form a partition wall.

[0050]

Also, according to the above described, in the case of the third manufacturing method for the preparation of a gas discharge panel according to the present invention, on the substrate plate with the formed on it in a

surface shape partition wall material, a cylindrically shaped press die, that has a shape that corresponds to the shape of the partition wall that must be formed, is pressed by a back up roller and pressure is applied to the press die, and by that, the bending deformation of the press die is reduced and easily and stably it is possible to form a partition wall.

[0051]

Also, the gas discharge panel that is suggested according to the present invention, it is provided with a partition wall that can be formed easily and stably, and it is also inexpensive.

[0052]

Also, the first structure found in the manufacturing equipment for the gas discharge panel according to the present invention is provided with a pressure part and a press die, and it is equipment whereby it is possible to easily and stably form a partition wall.

[0053]

Also, the second structure found in the manufacturing equipment for the gas discharge panel according to the present invention is provided with a cylindrically shaped press die and a structure that adjusts the pressure of this press die, and it is equipment whereby it is possible to easily and stably form a partition wall at a good precision.

[Brief Explanation of the Figures]

[Figure 1]

Figure 1 (a) ~ (d) represents a front view diagram of the process flow found in the Practical Example 1 of the present invention.

[Figure 2]

(a) Represents a partial cut out three-dimensional diagram of the structure according to the previous technology.

(b) Represents a partial top view diagram showing the structure according to the previous technology.

(c) Represents a partial sectional view diagram showing the structure according to the previous technology.

[Figure 3]

Represents a front view diagram of the process flow found in the Practical Example 2 of the present invention.

[Figure 4]

(a) Represents a front view diagram showing the structural example (11) found in the Practical Example 2 of the present invention.
(b) Represents a front view diagram showing the structural example (12) found in the Practical Example 2 of the present invention.
(c) Represents a front view diagram showing the structural example (13) found in the Practical Example 2 of the present invention.

[Figure 5]

Represents a front view diagram of the process flow found in the Practical Example 3 of the present invention.

[Figure 6]

Represents a side view diagram showing other structure found in the Practical Example 2 of the present invention.

[Figure 7]

(a) Sectional view diagram showing the structure found in the Practical Example 4 of the present invention.
(b) Sectional view diagram showing another structure found in the Practical Example 4 of the present invention.

[Figure 8]

Sectional view diagram found of the Practical Example 7 according to the present invention.

[Figure 9]

(a) Top view diagram found in the Practical Example 8 according to the present invention.
(b) A-A arrow in Figure 9 (a) sectional surface view according to the Practical Example 8 of the present invention.

[Figure 10]

Partial sectional surface view found in the case of the Practical Example 9 according to the present invention.

[Explanation of the symbols]

1.....partition wall material
2.....substrate plate
3.....press die (mold)
4.....partition wall
5a.....display electrodes
5b.....data electrodes
6.....dielectric material
7.....fluorescent light body
8.....cylindrically shaped press die
9.....pack up roller
10.....protective layer
11.....longitudinal stripe shaped press die
12..... transverse stripe shaped press
13.....lattice shaped press die
14.....rotation center
15.....rotation center – substrate plate distance

16.....bottom part
dielectric layer
20.....base A
21.....pressure part
25.....upper part
substrate plate
26.....bottom part
substrate plate
30.....base B
31.....table
32.....linear guide
33.....pinion
34.....rack
35.....position
determining pin
36.....pressure adjusting
screw
37.....bearing A
38.....guide A
39.....spring
40.....pulley
41.....driving motor
42.....gear belt
52.....bearing B
53.....guide B

Patent Assignee: Matsushita Denki Sangyo KK

Translated by Albena Blagev ((651) 735-1461 (h), (651) 704-7946 (w))

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